STORM WATER MANAGEMENT GUIDELINES FOR CONSTRUCTION ACTIVITIES

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Prepared by

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1.0 Introduction to Storm Water Management

Construction and urbanization are two major causes of water pollution. Disturbance of the soil resulting from construction can accelerate the erosion process and increase the sediment load in runoff and adversely affect receiving waters. In addition, increased impermeable surface due to urbanization can alter the quantity and quality of storm water runoff by facilitating the transportation of runoff and accumulated sediments from paved surfaces. The water-related impacts of construction and urbanization can include habitat alteration, higher peak flows and flooding, erosion, and increased pollutant loads (sediment, metals, nutrients, bacteria, etc.).

Involvement in construction and urbanization makes TxDOT a key player in the control of storm water pollution. As a key player, it is TxDOT's responsibility to be aware of the problem and to take measures to minimize and/or prevent storm water pollution. Therefore, it is the goal of TxDOT to prevent the degradation of receiving waters due to storm water runoff from highway operations. TxDOT is developing a comprehensive storm water management program aimed at achieving this goal. It is the purpose of this document to serve as part of this larger program, but construction activities deserve particular attention. Although other issues are mentioned such as project planning and maintenance, the focus of this document is to provide guidance on the use of storm water management measures during highway construction.

With this document, the user can develop a storm water management plan tailored to the needs of a particular project. In addition, the measures in this document will assist in meeting regulatory requirements where storm water is a concern. Although runoff control measures are required by law in some instances, these measures are applicable anywhere soil is disturbed and erosion and sedimentation are potential problems. The material in this manual is derived primarily from storm water guidance documents developed and adopted by the Texas Natural Resource Conservation Commission. In addition, a variety of recommended and approved sources of information were utilized to produce this document including, but not limited to:

- The Environmental Protection Agency's (EPA) Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices

- AASHTO's Highway Drainage Guidelines/Volume III

- EPA's Guidance on Specifying Management Measures of Sources of Nonpoint Source Pollution in Coastal Waters

- TNRCC's Description of BMPs for Tier I Projects

- Texas Transportation Institute's Research Report 1837-1, "Design Methods, Selection, and Cost-Effectiveness of Stormwater Quality Structures"

With the references compiled into this document, the user has a tool that serves as an integral part of TxDOT's storm water management program.

1.1 Purpose

The purpose of storm water management during construction is to allow the development of a highway while also accomplishing the three general erosion and sediment control objectives of:

- Preventing degradation of receiving waters
- Facilitating project construction and minimizing overall costs
- Complying with federal, state and local regulations

The first objective is to minimize effects to receiving waters. One problem with this approach is that, not only are many of the effects uncertain, there is no universal agreement as to what constitutes an undesirable effect. However, many offsite conditions are readily definable relative to the levels of sediment that may cause damage. Examples include clear water streams, impoundments, and developed areas. The designer of the erosion and sediment control measures should attempt to make some determination of the type and magnitude of offsite effects to be expected, to determine whether the effects will be detrimental, beneficial, or neutral, and temper the design accordingly. This determination may require some prediction or estimates of the quantity of eroded material that would be expected from the construction site. This information will allow an evaluation of what, if any, control measures are required and their size and extent of application.

The second objective deals with integration of the erosion control measures into the construction processes to facilitate construction and afford an overall cost-effective program. Control measures should be simple to construct, afford as little interruption to normal construction procedures as practicable, and be effective in their operation. Much is lost when a shotgun approach is taken, where the designer attempts to achieve total control of both erosion and sediment by calling for rigorous or inflexible design plan measures of questionable effectiveness.

Central to the preparation of an erosion and sediment control plan is an evaluation of each site for possible actions and their consequences. It is necessary to analyze the probable effects to be expected from both the implementation of the control measures as well as their omission, the location of the effects, whether or not the potential damage is acceptable, and the cost effectiveness of the chosen action. This analysis will establish if, and to what extent, a plan for erosion and sediment control is necessary.

The third objective is complying with federal, state, and local regulations. As a result of the National Environmental Policy Act of 1969 and the Clean Water Act of 1972, much attention has been directed to the control of erosion and sedimentation. Promulgated by

this concern are numerous state and federal regulations and controls governing land disturbance activities. At the federal level, several Executive orders and regulations address erosion and sediment control requirements on federally supported highway activities. There are also federal control requirements exerted by numerous agencies (Army Corps of Engineers, Environmental Protection Agency, Fish and Wildlife Service, etc.) through their administration of various permitting requirements (Section 404 and Section 402 of the Federal Water Pollution Control Act or Clean Water Act, and Sections 9 and 10 of the River and Harbor Act).

Section 402 of the Clean Water Act implements the National Pollutant Discharge Elimination System (NPDES) program. Under the NPDES storm water program, the EPA has issued a General Permit for Construction Activities. Information relating to the General Permit is included in Section 10.0

1.2 Objectives

In planning and design:

- Plan and design roadway projects to protect areas that provide important water quality benefits or are particularly susceptible to erosion and sediment loss

- Limit land disturbance such as clearing, grading, and cut and fill to reduce erosion and sediment loss

- Limit disturbance of natural drainage features and vegetation

The best time to address control of storm water pollution from roads and highways is during the initial planning and design phase. New roads and highways should be located with consideration of natural drainage patterns and planned to avoid encroachment on surface waters and wet areas. Where this is not possible, appropriate controls will be needed to minimize the impacts of storm water runoff on surface waters.

This principle emphasizes the importance of planning to identify potential water quality problems early in the design process. This process involves a detailed analysis of environmental features most associated with storm water pollution including topography, drainage patterns, soils, climate, existing land use, estimated traffic volume, and sensitive land areas. Highway locations selected, planned, and designed with considerations of these features will greatly minimize erosion and sedimentation and prevent storm water pollutants from entering waterways during and after construction. An important consideration in planning is the distance between a highway and watercourse that is needed to buffer the runoff flow and prevent potential contaminants from entering surface waters. Other design elements such as project alignment, gradient, cross section, and the number of stream crossings also must be taken into account to achieve successful control or erosion and nonpoint sources of pollution.

Designing for bridges requires that runoff impacts on surface waters from bridge decks be assessed and that appropriate management and treatment be employed to protect critical habitats, wetlands, fisheries, shellfish beds, and domestic water supplies. The siting of bridges should be a coordinated effort between TxDOT, the FHWA, and where applicable, the US Coast Guard and the US Army Corps of Engineers, as necessary.

Additionally, since bridge pavements are extensions of the connecting highway, runoff waters from the bridge decks can deliver loadings of heavy metals, hydrocarbons, toxic substances, and deicing chemicals to surface water as a result of discharge through scupper drains with no overland buffering. Bridge maintenance can also contribute heavy loads of lead, rust particles, paint, abrasives, solvents, and cleaners into surface waters. Protection against possible pollutant overloads can be afforded by minimizing the use of scuppers on bridges traversing very sensitive waters and conveying deck drainage to land for treatment. Whenever practical, bridge structures should be located to avoid crossing over sensitive areas to prevent washing of polluted runoff through scuppers into the waters below. Also, bridge design should account for potential scour and erosion, which may affect aquatic habitat and channel alignment.

In construction projects:

- Prevent erosion to the maximum extent practicable by the implementation of soil stabilization practices

- Control sedimentation by minimizing runoff velocities and retaining sediment onsite to the maximum extent practicable

- Prepare a storm water pollution prevention plan (SW3P) prior to construction; during construction, subject the SW3P to continuous reevaluation and revision based on the success or failure of the control measures

- Ensure the proper storage and disposal of toxic materials

Erosion and sedimentation from construction of roads, highways, and bridges, and from unstabilized cut and fill areas, can significantly impact surface waters and wetlands with silt and other pollutants including heavy metals, hydrocarbons, and toxic substances. Erosion and sediment control plans are effective in describing procedures for mitigating erosion problems at construction sites before any land disturbing activity begins.

Bridge construction projects include grade separations (bridges over roads) and waterbody crossings. Erosion problems at grade separations can result from water running off the bridge deck and runoff flowing onto the bridge deck during construction. Controlling this runoff can prevent erosion of slope fills and the undermining failure of the concrete slab at the bridge approach. Bridge construction over waterbodies requires careful planning to limit the disturbance of streambanks. Soil materials excavated for footings in or near the water should be removed and relocated to prevent the material from being washed back into the waterbody. Protective berms, diversion ditches, and silt

fences parallel to the waterway can be effective in preventing sediment from reaching the waterway.

Wetland areas will need special consideration if affected by highway construction, particularly in areas where construction involves adding fill, dredging or installing pilings. Highway development is most disruptive in wetlands since it may cause increased sediment loss, alteration of surface drainage patterns, changes in the subsurface water table, and loss of wetland habitat. To safeguard these fragile areas, the best practice is to locate roads and highways with sufficient setback distances between the highway right of way and any wetland or riparian areas. Bridge construction also can impact water circulation and quality in wetland areas, making special techniques necessary to accommodate construction.

To ensure the proper storage and disposal of toxic materials, the objective is to guard against toxic spills and hazardous loadings at construction sites from equipment and fuel storage sites. Toxic substances tend to bind fine soil particles; however, by controlling sediment mobilization, it is possible to limit the loadings of these pollutants. Also, some substances such as fuels and solvents are hazardous and excess applications or spills during construction can pose significant environmental impacts. Proper management and control of toxic substances and hazardous materials should be the adopted procedure for all construction projects and should be established by erosion and sediment control plans.

For maintenance:

- Incorporate pollution prevention procedures into the operation and maintenance of roads, highways, and bridges to reduce pollutants entering receiving waters

Substantial amounts of eroded material and other pollutants can be generated by operation and maintenance procedures for highways, bridges, and from sparsely vegetated areas, cracked pavements, potholes, and poorly operating urban runoff control structures. This principle is intended to ensure that pollutant loadings from roads, highways, and bridges are minimized by the development and implementation of a program and associated practices to ensure that sediment and toxic substance loadings from operation and maintenance activities do not impair receiving waters. The program to be developed, using the practices described in this management measure should consist of and identify standard operating procedures for nutrient and pesticide management, road salt use minimization, maintenance guidelines (e.g., capture and contain paint chips and other particulates from bridge maintenance operations, resurfacing, and pothole repairs), and vegetation management.